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ABSTRACT

This handbook outlines ways to conduct audio conferences, provides a review of the kinds of equipment needed, analyzes various cost factors, and offers guidelines for establishing an appropriate role for this technology in a human service environment. The results of an audio conference project designed for a service dealing with developmentally disabled persons in Vermont illustrate decision-making and problem solving techniques that can be used in any type of human service organization to help choose an appropriate communications channel for the desired services. The handbook includes sections on assessing organizational needs, setting up a conferencing system, designing an audio conference, and maintaining a conferencing network beyond its preliminary funding stages. Appendices provide information on equipment suppliers, providers of conference bridging services, and publications pertaining to teleconferencing programs and techniques. (MER)

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1981 AUDIO CONFERENCING HANDBOOK

Alternate Media Center
New York University, School of the Arts

and

Institute for the Future

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FOREWORD

The information in this handbook was originally compiled to meet the needs of a specific project--an HEW-funded demonstration on the uses of telecommunications in service to the developmentally disabled. Many sources have been tapped to gather the data presented here. Such data were crucial to the project planners in reaching decisions on the future of the demonstration. Because much of this information has relevance to other groups who might be considering using audio conferencing in a human service setting, this handbook was conceived.

The handbook is likely to have dated material as soon as it is released. Suppliers change, prices go up, new products are introduced--in a fast-changing technological environment, it is impossible to provide a current and accurate listing. Recognizing this limitation, Institute for the Future and AMC hope to update this handbook periodically.

To do so, we invite your comments and criticisms by way of the Reader Response Form at the end of the handbook. Please return it to:

Audio Conferencing Handbook Revision
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INTRODUCTION

Teleconferencing is the generic term for group communication through an electronic medium. This handbook focuses on audio conferencing, in which the electronic medium is normal, "voice-grade" telephone lines. It outlines ways of conducting audio conferences, reviews what kinds of equipment are needed, analyzes various cost factors, and offers guidelines for establishing an appropriate role for this technology in a human service environment.

This handbook has grown out of an HEW-funded telecommunications project in Vermont that designed and implemented an audio conferencing system to improve services to developmentally disabled (DD) people.* Vermont is a largely rural state, in which distance and weather form major barriers to frequent face-to-face communication. While specific considerations may be germane only to Vermont or to the DD service network, the majority of decisions and problem-solving techniques used in this project can be applied across the board to other human service organizations.

Audio conferencing is the least expensive and, for most groups, most readily usable method of teleconferencing. Even so, many factors inhibit greater use of this rather simple technology--factors that range from organizational inertia to a basic mistrust of technology. The decision to use teleconferencing rather than face-to-face meetings is usually based on the realization that teleconferencing is an answer to certain needs--reducing travel time and cost, speeding communication, or communicating with people who cannot travel.

But it may only be a partial answer and only in particular contexts. Although audio conferencing can be a useful tool, it is not a panacea for communication problems. It cannot create communication; it is only a transmission medium. The effective use of teleconferencing requires a new understanding of issues in group communication and a skillful blending of the energies of each participant.

Implementing the process of audio conferencing entails two distinct phases: (1) planning and (2) conducting the conference. Each of these phases may involve difficult management decisions. The cohesion of the plan and its execution, however, are what distinguish a successful use of audio conferencing.

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*See Appendix D for a description of the telecommunications project.

This handbook is intended to assist prospective users of audio conferencing in considering whether and how they might effectively use this technology. Several key questions will be addressed:

- How do I assess my organization's communication needs?
- What type of audio teleconferencing is best suited to the needs of my group?
- How can I best structure my audio conferences?

Some information on costs, suppliers, and services is included. However, all of these are subject to frequent change. (Readers are encouraged to contact vendors and telephone company business offices for the most recent information. In addition, readers are welcome to contact members of the project team.)

ASSESSING NEEDS

Before you check out equipment or compare prices or scan down the list of pointers for conducting a successful teleconference, you ought to answer one question: Is there a need? The answer to that question may not be simple. Consider the following:

Communication patterns. First, watch the current communication patterns within your organization, as well as its communication with other groups. Who communicates with whom? How often? Who should communicate with others but doesn't? If your organizational structure requires frequent group decisions, can the necessary decision makers be pulled together rapidly and easily?

Characteristics of current meetings. How often must three or more people meet to plan agendas, confer with working groups, or conduct full-fledged meetings? For instance, are draft proposals that need comments from multiple parties frequently distributed in advance? How long do meetings last? Could they be shorter? Could larger meetings be conveniently broken into smaller working groups? How formal or informal are your meetings? Are discussions often open-ended or do you tend to move rapidly from point to point? What is the content of the typical meeting? Do you often find the need for an additional conferee on short notice?

Present travel constraints. A lot of time can be spent traveling to and from meetings--it may actually exceed the time spent in those meetings. It may also interfere with other work objectives. Some people use travel time to catch up on paperwork, reading, or sleep; some well-organized individuals can dictate while driving. However, many people find travel wearing and inconvenient. In largely rural areas, long distances, poor roads, and bad weather take their toll, while in urban areas, coping with aggressive traffic, congestion, and parking can be as frustrating and time-consuming as a longer rural trip. Travel constraints influence the lead time you need to schedule meetings. That lead time may be an important factor when decisions must be made rapidly.

Travel costs should be evaluated on the basis of three factors. Actual out-of-pocket expenses such as mileage, meals, and lodging are the easiest to compute. However, two other factors should also be evaluated: the cost of work not accomplished while away from the home base and the cost of personal time consumed by travel.

Hopes and expectations. Ideally, what would you like the technology to do? Do you want to involve more people within your group on a highly interactive basis? Do

you want to expand the group to include people not able to participate frequently? Do you want to be able to make graphic presentations in addition to exchanging opinions and ideas? Of course you will temper those ideal needs with practicality. Realistic expectations will have to be formed around what you really need--and what you can afford. Telecommunications technology may allow you to consider many exciting possibilities, but none of these opportunities comes free, or even inexpensively. The cost of an audio conference should be weighed carefully against all other factors involved.

Openness to innovation. Even the best-designed systems can quickly run into difficulties if inadequate attention has been paid to the users' openness to the adjustments they will have to make. Introducing a new technology means introducing change, and people respond better to change if they have been prepared.

If your organization has a history of quickly adopting new ideas or technologies, only to tire of them as soon as problems arise, your approach must be decidedly different from the approach you would adopt for a more conservative group that moves slowly but tends to hang on to new techniques once they have proven themselves. Individuals or subgroups within the existing structure may act more quickly to try out a new technique. Given the proper framework in which to evaluate the technology, they may act as a catalyst for other groups. Try to identify a group within your organization that is currently having difficulties in communication but has shown an ability in the past for problem solving. Have them try out audio conferencing for a set period of time and let them report back to you and the others their experiences--positive and negative. If the overall effect is positive, use this as your leverage with other groups.

Effective organizing. Technology can do nothing by itself. Successful introduction and use require organization, vision, and salesmanship. Your group must have an effective coordinator who is willing to spend the time to get to know the technology thoroughly. He or she must be capable of explaining both the advantages and the constraints of the new technology--what the innovation can and cannot accomplish. The coordinator should work with potential users to define their needs and match them to the capabilities of the technology. The coordinator must have a sense of commitment and be able to encourage commitment within others if the technology is to become an integral and effective part of your group's way of conducting meetings.

Without effective organizing very little will happen, no matter how beneficial audio conferencing may appear in the abstract. Providing the time and support for a coordinator must be considered as one of the costs in adopting audio conferencing technology.

Priorities. Once you have considered the factors just mentioned, you can proceed to evaluate the needs that audio conferencing is best suited to meet. Audio conferences allow busy people to get together quickly. They are most effective for meetings that last an hour or less. The better structured or organized the meeting, the more effective it will be. Audio conferences are well suited to discussions of policy or procedure but less effective if there is a difference of opinion on major issues.*

Audio conferencing should not be viewed as a simple substitute for present forms of group communication. Rather, it should be viewed as an additional tool that, used creatively, can enhance existing communication modes.

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*For a summary of tasks that are well and poorly suited to teleconferencing, according to the current wisdom, see Robert Johansen et al., Electronic Meetings: Technical Alternatives and Social Choices (Reading, MA: Addison-Wesley Publishing Company), 1979.

SETTING UP A SYSTEM

Once a thorough needs assessment has been completed, a decision can be made as to what type of system is best suited to the needs of the group. Regardless of the number of participants, an audio conferencing system includes three basic components: (1) the equipment actually used by each participant, such as a telephone headset or an amplified telephone; (2) a method to connect, or bridge, all of the parties; and (3) transmission facilities to carry the conversation. As you make choices about these components, you will need to address questions like the following:

- **Should the system use permanent conferencing facilities with dedicated lines to each location?** This may be the best option if the majority of audio conferences occur in predictable and readily accessed locations. Because dedicated lines are more expensive than normal voice-grade telephone lines, the cost must be weighed against the potential use of the facility. Dedicated facilities typically utilize four-wire private-line circuits (signals are transmitted over one pair and received over another pair), which improves the overall sound quality.

- **Can telephone lines within an existing network be accessed as needed for audio conferences using a simple bridging technique?** If a relatively small number of people conference frequently, they can add a portable bridge to an existing five-button telephone key set. This is a low-cost option that sacrifices some degree of audio quality but has the advantages of adaptability and rapid implementation. Circuits are invariably two-wire.

- **Are the majority of potential users spread over a large geographic area that would vary from conference to conference?** If this is the case, and if there are a large number of users, then a central conference bridge with multiple access points that are not fixed would be the better choice. Typically, in this design circuits will be two-wire only or, less frequently, a combination of two-wire and four-wire. Since different transmission lines are used each time, audio quality may be less reliable than in the dedicated network.

Because current design in telecommunications technology gives the user such a large number of options, it is possible to configure your network to your specific needs. One of the most appealing aspects of the audio conference is that it can take

place virtually anywhere there is a telephone. Group members may be at the office, at home, on the road, or in specially designed meeting rooms that have conference equipment. The setting need not be, and in most instances is not, elaborate.

PARTICIPANT'S EQUIPMENT

The simplest, most readily available piece of audio conferencing equipment is the normal telephone handset. It has the advantages of familiarity, predictable sound quality, and no additional cost. Its major disadvantages are that it limits a line to one person, it may be cumbersome for the handicapped, and it contributes to fatigue if one must hold the receiver for long periods.

Some business telephones with a built-in speaker are commercially available--both from the phone company and private vendors. These devices are adequate to allow a small number of people in a room to listen but they have a tendency to produce a tinny sound and can easily pick up background noise (especially if the room has bare walls and floors) resulting in echo-like or reverberating sound.

A wide variety of add-on components can be rented or purchased to turn the normal handset into a hands-free instrument. Of the nine components tested during the Vermont field trials, four are described here.

The **Speakerphone 4A** is produced by Western Electric and can be rented through many local telephone companies. It is readily compatible with Bell System equipment. The unit is designed for small groups (up to five). Current rental cost in Vermont is $12.50 per month. Installation charges are extra.

The **Conference Set 50A**, also produced by Western Electric, is suitable for groups of 6-12. The unit attaches to the phone outlet via a four-prong or modular plug and consists of a telephone with a built-in microphone, two external microphones that can be clipped onto clothing or stand alone, and a speaker--all with carrying case. Its audio quality is comparable to that of the Speakerphone 4A. Rental cost in Vermont is $15.25 per month.

The **Conference Set 50B**, manufactured by Precision Components, looks like the 50A, but its internal circuitry produces better audio quality. Like the 50A, it is portable. Purchase price is currently $595.00. Additional microphones, microphone mixers, and a portable public address system are also available.

An important consideration about amplified telephones: other things being equal, the greater the number of locations, the lower the overall quality of sound. Also, when using amplified telephones, you should be aware that different brands may be poorly compatible. If it is a choice between including or excluding a party with a different brand of equipment, however, you will probably be able to live with the lower sound quality.

All of the amplified telephones just described are "voice-activated"--that is, whoever speaks or makes a noise takes over the circuit. In multiparty conferencing, especially with 10 or more locations, voice-activated switching can become very disruptive, unless participants are particularly careful not to create extraneous noise (for example, by judicious use of the noise suppressor or other privacy switch on their end instrument). Even then, extraneous noise can't be entirely removed in a noisy environment.

The Darome Miniconvener, "push-to-talk" amplified telephone, is designed to minimize the voice-switching problem. Although it produces superior sound quality, the push-to-talk feature may prove inhibiting for highly interactive discussions. It is, however, well suited to a telelecture format. The current cost for a two-wire Miniconvener, four microphones, and carrying case is $692.00.

BRIDGING

In-house bridging capability. Before considering the range of bridging alternatives, it is worth exploring your own organization's telephone system, especially if you are in a large organization with a Private Branch Exchange (PBX) or Centrex System. Some of these systems have a built-in conference feature. The usability and usefulness of this feature vary widely. If you have access to such a system, a little experimentation with noncritical conferences will quickly tell you if the PBX is adaptable enough for your needs.

Conference operator. The simplest method of linking the participants in an audio conference, especially if you are trying out the idea for the first time, is to place the call through the telephone company conference operator. You must call the conference operator in advance, preferably 24 hours, although a conference call can generally be arranged on shorter notice. Give the operator the names and telephone numbers of the participants and the time the conference is scheduled. The operator will place the calls at, or just before, the designated time, connecting the members of the conference one after another.

While simple, this method has its drawbacks. The sound quality can be uneven, and waiting for the operator to call each participant in turn can be very tedious. Also it is a relatively expensive way to conduct a conference call. The cost is calculated by using the person-to-person rate between the two most geographically distant points. Each additional caller is charged at approximately 70 percent of this rate for the first three minutes. The cost for each additional minute after the first three is calculated at 20 percent of the total cost for the initial period.

For example, the cost for a five-party call with San Francisco and New York the two most distant points would be:

First 2 points	=	$ 3.55
70% x 3 additional points	=	7.45
Total for initial 3-minute period	=	$11.00
Cost for each additional minute	=	$ 2.20

Commercial conferencing services. The Darome Connection in Danbury, Connecticut and the Kellogg Corporation in Littleton, Colorado currently offer audio conferencing services. Using these commercial bridges is generally more expensive than telephone company conference calls, but both Darome and Kellogg provide additional training and support services that can improve the quality of the conference.

Darome offers audio conferencing in three formats; two are applicable here. "Online" conferences are direct-dial calls, assisted by a Darome operator, and must be scheduled in advance. For use of the bridge and Darome operator, the cost is $0.333 per minute per location with a one-half hour minimum. Up to 80 locations can be connected at once. "Party-line" conferences are arranged for groups of five or fewer who convene after business hours. These are connected automatically without operator assistance. The cost is a flat rate of $100 for four consecutive hours. Kellogg offers a direct-dial, operator-assisted conference that can connect up to 20 locations. The charge is $3.00 per quarter hour per location. With both services, each caller assumes the cost for the call to the conference bridge.

Portable bridge. If you have audio conference experience and your group would typically involve no more than five locations per conference, you might consider purchasing a desk-top bridging apparatus. The project purchased one such unit, the Telepatcher KTS 500, for $470.00 and tested it in Vermont. The unit requires a five-button key set telephone, to which it is connected by a three-way adaptor or by running a

second cable to the telephone. You can use any combination of lines from the telephone (WATS, DDD, etc.). Conferences can be initiated from the key set, or participants can call into the conference over the lines on the key set. Conferees are bridged together by an attendant at the telephone.

The most obvious advantage of this unit is that you can avoid the more expensive operator-assisted conference call. There are three major disadvantages: (1) five locations is the maximum that can be connected for a given conference; (2) someone must be present at the bridge location to initiate the conference call, which can preclude evening or night conferences; and (3) sound quality may be poor.

Stationary bridge. Stationary bridges are units installed either on the customer's premises with a PBX or at the telephone company central office. They may, or may not be attended by a switchboard operator. The unattended variety are called "meet-me" bridges because parties call in at a prearranged time. Stationary bridges can provide a dedicated teleconferencing function for 5 to 40 points at one time. The most sophisticated, and most expensive, can simultaneously provide conferencing for different groups and regroup on a dynamic basis as needed.

Two meet-me bridges manufactured by Telephonic Equipment Corporation were selected for the Vermont project. Once interconnected, the two bridges provided a total line capacity of 18 per conference. Although this bridge does not permit several conferences to occur simultaneously, it was affordable and adequate to the needs of the users.

Successful installation of a conference bridge in a telephone company central office demands a close working relationship with the local telephone operating company. There are many technical, engineering, and regulatory hurdles to overcome. The Vermont experience can serve as a model for other local operating companies. New England Bell devised a Special Assembly Tariff for the Vermont bridge. Under the terms of this tariff, New England Bell purchased the bridge outright, which allowed the telephone company to engineer the bridge to proper specifications and make trouble-shooting on the system simpler. A two-tiered pricing schedule was then established for lease of the bridge: the initial fee was $2,725.00 plus $400.00 for installation. Monthly maintenance is $37.00.

Ongoing maintenance and line costs for the Vermont bridge vary with usage and changes in line configuration. As more groups become familiar with audio conferencing

and establish their own dedicated networks, we envision a situation where the Vermont bridge could offer access to the conference bridge for use by other groups inside and outside their state. Obviously, the economies in sharing increase with greater use and with close proximity to the conference bridge.

TRANSMISSION

The Public Switched Network (PSN) is the system linking individual phones to local telephone offices and the intercity, long distance network. PSN rates are based on the duration of the call, the distance between points, and the time of day when the call is placed. An additional surcharge is added to the call for special services (operator assistance, collect, etc.). Becoming involved in audio conferencing will necessitate familiarity with the prevailing local and long distance rates.

Operator-assisted audio conferences and conferences using a desk-top bridge typically are transmitted over the PSN. However, if you plan to have a large number of conferences and a large number of callers, you may prefer to use a private, dedicated network or a hybrid of PSN and private networks.

There are two major reasons for considering private or hybrid networks: quality of sound transmission and cost. When a number of locations are engaged in a conference over the PSN, each call comes into the central bridge over a random choice of all available telephone circuits. If one or more parties connects with a circuit that has a lot of static, for example, it is impossible to trace the source of the problem. The only solution is for the party to hang up and try again, hoping that the next randomly selected circuit will be better. In a private or dedicated network, calls come in over a constant circuit, assuring that the sound quality can be specifically engineered and maintained to provide a constant quality of service. With a dedicated network, you can also be sure that your circuit will be free when you need it, even at high traffic times.

If you are using the PSN and have a high volume of calling traffic between two points, or within a specific geographic region, you may be able to take advantage of services offered by the telephone companies that can lower your overall calling costs. The services most applicable to audio conferencing are: WATS lines, private lines, and DDD lines. In Vermont, by carefully monitoring calling patterns, and ordering the appropriate types of service, costs were reduced to one-third what they would have been utilizing the Bell System conference operator.

WATS. WATS is the acronym for Wide Area Telephone Service. WATS provides one-way service only, either into a fixed point (800 Service) or out from that point (Out-WATS). In audio conferencing with a meet-me bridge, you would be concerned primarily with 800 Service, which allows people to make a long distance call without having to pay long distance charges. The charge for the call is paid for by the WATS line subscriber.

A statewide WATS line allows all callers within the state to access the fixed point at the same cost. Cost is based on time only, not on distance. There is no discount for evening or night calls, however. WATS service can be purchased in two ways: Measured Time (MT) WATS or Full Business Day (FBD) WATS. Measured Time WATS is the most reasonable service unless you typically have more than 50 hours per month usage on a single line. When you purchase a WATS line, you guarantee the telephone company that you will pay for a minimum of 10 hours' usage a month at a fixed rate. Each additional tenth of an hour is then charged at a lower rate than for the 10-hour minimum. For example, in Vermont, the basic rate for MT WATS is $15 per hour for the first 10 hours. Overtime is charged at the rate of $11.75 per hour. Full Business Day WATS allows you 240 hours' calling time on a single line for a flat rate of $615.00 per month, which is equivalent to $6.15 per hour if 100 hours are used.*

Important facts to remember about WATS service: (1) There is absolutely no advantage to you as the service provider in keeping usage under 10 hours per month on an MT WATS line. Remember, you are paying a premium for this initial period so that you can take advantage of the drop in cost for additional usage after the 10-hour minimum. (2) There is no difference between MT and FBD WATS in the type of service provided. The change from one type of service to the other is nothing other than a billing change. (3) Your WATS bill normally lists only the total hours used. The telephone company will identify the origination or duration of individual calls for an added charge.

Private lines. Private line service provides unlimited calling between two points at a flat rate. Three types of private line service are commonly used in audio conferencing: Foreign eXchange (FX), Off-Premises eXtension (OPX), and tie lines.

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*See Appendix C for a description of changes pending in the WATS pricing structure.

FX service allows callers in a distant city to enter the conference network by dialing a local number, which saves them the long distance charge. FX service is especially valuable if many conferences involve parties from a single city distant from the conference bridge. FX lines vary in price based on the distance, in air miles, between the two points connected. In addition, the subscriber must pay for a circuit termination (the connection of the line into the bridge, PBX, etc.) at each end.

For example, the conference bridge in Vermont is located in Burlington. Waterbury, where many state offices are located, is 27.75 miles distant. To compute the monthly cost using New England's $4.40 mileage rate for FX service:

Mileage charges	$4.40 x 27.75	=	$122.15
Termination charges	$3.85 x 2	=	7.70
	TOTAL		$129.85

Because of the large volume of calls between these two points, it was less expensive to install an FX line than to use WATS service. The cost of OPX and tie line service is calculated in the same manner as for FX service.

OPX service allows a caller to pick up an extension phone and be automatically connected into the conference network. This type of service is frequently used in dedicated, fixed-location networks.

Tie lines connect two switchboards together. There is no termination charge for tie line service.

DDD. Most calls placed within the PSN are over Direct Distance Dialing lines. The monthly charge for each line generally includes local calls. Each long distance call is itemized, giving you a complete record of the number called, time of day, duration of the call, and charges.

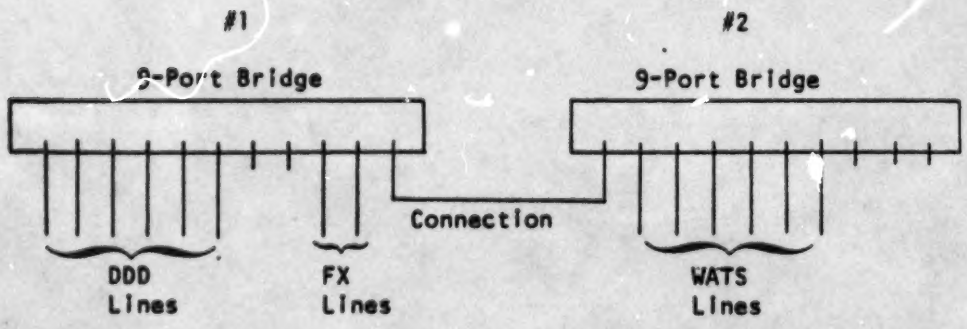
Final implementation of the audio conferencing system in Vermont carefully followed the steps outlined in this handbook. During the initial phase, a variety of amplification devices were evaluated for their ease of use by the Vermont consumer groups. Early conferences were conducted using the Bell System conference operator. After participants had become familiar with the techniques of audio conferencing, the small desk-top bridging device was installed as a lower-cost interim solution for small conferencing groups.

Data were collected from all conference calls logged during the first four months and were analyzed for duration, frequency, location, and number of participants per conference. The resulting usage patterns showed that two calling areas (Burlington and Waterbury) were involved in 40 percent of the conference activity. The remaining 60 percent of calls originated from widely dispersed areas in the state. Over 95 percent of all conferences could be accommodated by a bridge that provided access from 11 points.

Technical considerations required that the bridge be installed at the telephone company central office in Burlington. Therefore, of the 18 available ports, five accommodate local access lines for Burlington, two provide FX lines from Waterbury, and six offer statewide 800 Service. The remaining five ports on the bridge have been left to accommodate future expansion. Figure 1 shows the configuration of the bridging apparatus and access facilities.

FIGURE 1

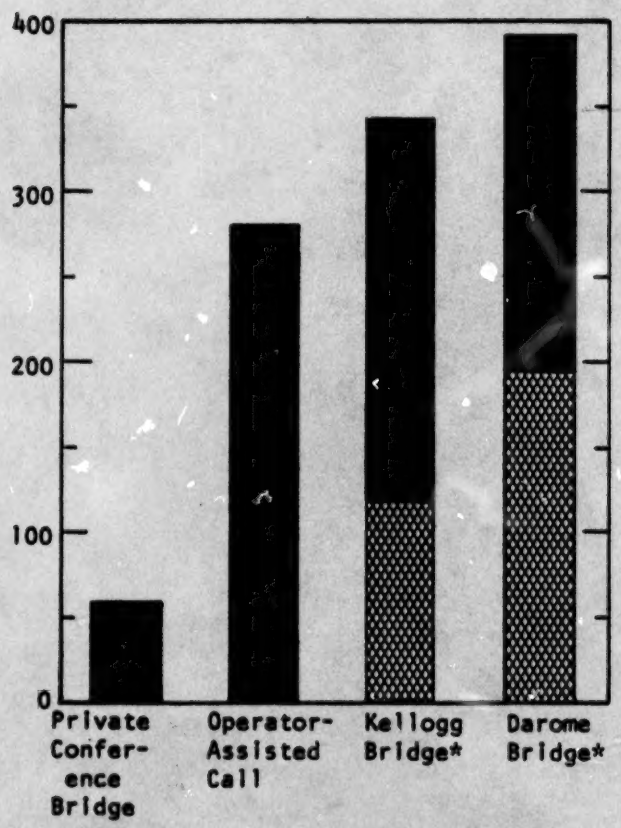
VERMONT'S "MEET-ME" CONFERENCE BRIDGE



The bar graph in Figure 2 compares the cost of a 10-party teleconference held over the Vermont meet-me bridge with the costs of assistance by the conference operator or using Kellogg or Darome services. See Appendix C for more information on costs of audio conferencing.

FIGURE 2

COST COMPARISON: ONE-HOUR AUDIO CONFERENCE AMONG TEN LOCATIONS IN VERMONT



The audio conferencing system you choose will depend on your needs, usage patterns, and interests. The only way to determine which participant's equipment, bridging capabilities, and transmission facilities are most appropriate is by trying a variety of conferences and keeping accurate records of their characteristics and costs. In the early stages of any evaluation of audio conferencing, it is important to keep things small. Although this may mean higher initial costs, it allows greater flexibility until you determine the system best suited to your needs.

STRUCTURING AN AUDIO CONFERENCE

Setting up the physical conferencing system is only one part of the implementation process. It is necessary but not sufficient to an effective audio conference. The other factors largely have to do with sensitivity to people's motives and wishes, with organizational skills and group leadership. Some helpful publications giving basic pointers for conducting audio conferences are listed in the Bibliography. A few points are critical to any successful audio conference.

1. **Know your group.** For your first conferences, select groups that are "failure tolerant." All may not go perfectly the first time or two, or even three, that you attempt electronic meetings (although audio conferences generally work better than people expect). You need participants who are patient and tolerant enough not to develop instant antipathy to the technology.

2. **Identify specific goals.** Determine in advance what you want to accomplish. How many locations will be involved? Will anyone need to join the conference in the middle to give a presentation or answer specific questions? Organizational meetings (meetings about meetings) in which all participants know one another and are working out procedural problems are good bets for first conferences.

3. **Organize your meeting.** Teleconferences seem to organize even the most haphazard of us. When you cannot see the rest of the group, it is vitally important that everyone have a sense of the meeting agenda. Every meeting should have a moderator who keeps discussion focused, introduces speakers, and summarizes the meeting content. Try to limit meetings to an hour or less (this is about the maximum time someone can hold a receiver to an ear and still be functional).

4. **Monitor the interaction.** The moderator should be relatively formal but friendly and supportive. Time should be allotted at the beginning of the meeting for participants to engage in small talk--in fact, initial introductions are very important, especially if all the participants do not know each other. The moderator should encourage everyone to identify him- or herself and to talk to others by name. The moderator should invite everyone's comments; one person or group should not be allowed to monopolize the conversation.

5. **Experiment with formats.** Some meetings work better with an open format, others with specific sections prepared by one or more participants. Experiment until you find the type or types of meetings most comfortable for your working group--and even then, leave room for innovation.

6. **Schedule in advance.** Sometimes a conference can be scheduled on short notice, but advance planning is obviously a help. Once you have determined the date and time for the conference, send a notice to all participants. If you plan to use the conference operator, contact him or her at least 24 hours in advance with a list of the participants' names and and their telephone numbers.

7. **Mail agenda and accompanying material in advance.** Some meetings require reference to documents, figures, and so forth. These should be prepared in advance and mailed with the agenda to all participants. Pages and specific items should be numbered to provide easy reference during discussion. Using different colored pages for different topics is also helpful.

8. **Accessories can enhance your audio-only capabilities.** Slow-scan video and the electronic blackboard can be used effectively in conjunction with audio conferencing. (Sources for both are listed in Appendix A.) Mailing slides in advance to conference locations can also add a new dimension. Some slide projectors can be set to advance automatically when a touch-tone signal is depressed. Existing blackboards at two or more locations can be used to list major points covered by participants, increasing the level of active participation.

9. **Evaluate effectiveness.** The most important question is usually: Did the meeting work? Get reactions from participants in the meeting. It's important to assess both subjective and objective impressions. Failures can be more instructive than successes, especially in the early learning stages. Sound quality will be one of the more disturbing variables for many people. It's rarely perfect, but is it adequate? Develop your own guidelines as you go along.

10. **Let your users be your advocates.** The best advocate for audio conferencing is the satisfied user. If users can accomplish needed tasks in less time, at lower cost, and at greater convenience through audio conferencing, they are the nucleus for a potential network of users.

CARRYING ON WITH THE PROJECT

The current and future activities of the telecommunications project in Vermont may be of interest to you for two reasons. If your organization is based in Vermont, their regional services and expertise would obviously be of help. Secondly, wherever your group is located, the evolution of this demonstration project may provide a useful model for your group's planning.

Early in the demonstration period, a local advisory board was set up in Vermont. As the project neared completion, the advisory board appointed a transition committee to determine the form in which telecommunications applications would continue after the demonstration grant had run out.

After consulting with the Developmental Disabilities Council, the UAF Satellite, and the Agency for Human Services, the transition committee decided to form a nonprofit corporation, Vermont Telecommunications, Inc., to manage the existing telecommunications projects, plan for extension of telecommunications services to the DD population in the state, and aid in the dissemination of information about their experiences.

The current design of teleconferencing services in Vermont is not static. In fact, it will change as often as there is a need to increase access, expand the range of services, or alter the type of facilities provided. Inquiries about services provided by the teleconferencing group in Vermont or about specific experiences with audio conferencing techniques should be directed to:

Vermont Telecommunications, Inc.
103 South Main Street
Waterbury, Vermont 05676
802-241-2929

APPENDIX A

CONFERENCING EQUIPMENT SUPPLIERS

AUDIO CONFERENCING

Western Electric
(Contact your local telephone business office)

Precision Components
1110 West National Avenue
Addison, Illinois 60601
312-543-6400

Telephonic Equipment Corporation
17401 Armstrong Avenue
Irvine, California 92714
714-546-7903

The Darome Connection
711 East Diggins Street
Harvard, Illinois 60033
815-943-5481 or 800-435-6174

SLOW-SCAN

Colorado Video, Inc.
Box 928
Boulder, Colorado 80306
303-444-3972

Robot Research, Inc.
7591 Convoy Court
San Diego, California 92111
714-279-9430

NEC America, Inc.
130 Martin Lane
Elk Grove Village, Illinois 60007
312-640-3792

ELECTRONIC BLACKBOARD

Western Electric
(Contact your local telephone business office)

APPENDIX B

CURRENT PROVIDERS OF CONFERENCE BRIDGE SERVICES

COMMERCIAL BRIDGING SERVICES

Local telephone company
(Contact your local or regional conference operator)

The Darome Connection
8 West Street, Suite 19
Danbury, Connecticut 06810
203-797-1300 or 800-243-0991

Kellogg Corporation
560 South Broadway, Suite 400
Littleton, Colorado 80121
303-794-1818

NONPROFIT BRIDGING SERVICES

Vermont Telecommunications, Inc.
103 South Main Street
Waterbury, Vermont 05676
802-241-2929

University of Wisconsin-Extension
Old Radio Hall
Observatory Drive
Madison, Wisconsin 53706
608-262-4342

APPENDIX C

COST COMPARISONS

The following formulas are current as of December 1980 but are likely to change frequently.

OPERATOR-ASSISTED CONFERENCES:

Initial Period

(1) Refer to Table 1 to determine the person-to-person rate that applies to the two most geographically separated points in the conference.

(2) Table 1 shows the cost of each additional station, depending upon the initial period rate. Multiply that figure by the number of stations over two in the conference.

(3) Add (1) and (2) to determine the total cost for the first three minutes of the conference call.

TABLE 1

OPERATOR-ASSISTED CONFERENCE CHARGES
INITIAL PERIOD

If the farthest distance is:	The initial 3-minute rate is:	Each additional station is:
1 -10 miles	$1.45	$1.00
11 -16	1.60	1.25
17 -22	1.80	1.50
23 -30	2.00	1.50
31 -40	2.10	1.75
41 -55	2.35	1.75
56 -70	2.60	2.00
71 -124	2.75	2.00
125 -196	2.85	2.25
197 -292	2.95	2.25
293 -430	3.05	2.25
431 -925	3.15	2.25
926 -1910	3.30	2.25
1911 -3000	3.55	2.50

Additional period

(4) The additional period rate is computed as 20 percent of the total for the initial period determined in (3) above.

(5) Multiply (4) by the conference duration in excess of three minutes.

Total cost

(6) Add (3) and (5) to determine the total cost of the conference.

NOTE: Conferences that involve over 10 locations are charged for a minimum of 10 minutes as the initial period. Intrastate conference calls may be computed similarly, but there will be some differences. Check with your local operating company or the PUC if you wish to have exact figures.

DAROME CONFERENCES:

(1) Multiply the number of locations by the duration of the conference (in minutes) by $0.333.

(2) Determine the long distance charges between each location and Danbury, Connecticut.

First minute x number of locations	_____
Each additional minute x number of minutes x number of locations	_____
Total	_____

(3) Add (1) and (2) to determine the conference cost.

KELLOGG CONFERENCES:

(1) Multiply the number of locations by the duration of the conference (in quarters of an hour) by $3.00.

(2) Determine the long distance charges between each location and Littleton, Colorado.

First minute x number of locations	_____
Each additional minute x number of minutes x number of locations	_____
Total	_____

(3) Add (1) and (2) to determine the conference cost.

FX LINES:

(1) Determine the distance from the distant city to the conference bridge.

(2) Multiply the distance by the rate per mile for private lines (this varies from state to state, but can be determined by contacting the local telephone operating company).

(3) Determine the local circuit charge for the termination in the distant city.

(4) Determine if any other termination charges apply.

(5) Add (2), (3), and (4) for the total monthly cost.

(6) Remember that there will be a one-time installation charge.

(7) Private line orders can take up to 60 days for processing.

INTRASTATE WATS LINES:

(1) Measured Time (MT) WATS gives you 10 hours of calling at a flat rate (usually slightly higher than DDD).

(2) Each hour over the 10-hour minimum is charged at a reduced rate (typically 20-25 percent less than the initial rate).

(3) The total cost per line increases as usage increases.

(4) If the total usage exceeds 30 hours per line, it is more economical to purchase Full Business Day (FBD) WATS service, which is offered at a flat rate.

(5) There is a one-time installation charge.

(6) Order processing can take up to 60 days.

INTERSTATE WATS LINES:

AT&T has proposed a new tariff for interstate WATS service that is scheduled to take effect on July 1, 1981. The new WATS structure for interstate Out-WATS and 800 Service will lower costs to small users, and increase the costs to large users.

The requirements for a minimum of 10 hours' usage per line is eliminated. Measured Time (MT) WATS and Full Business Day (FBD) WATS are combined into a single class of service.

The user will pay a flat monthly rate for each WATS line ($27.50 for Out-WATS and $32.00 for 800 Service).

Usage is charged through a tapered rate schedule in increments of 0.1 hour. The rate per hour will decrease as usage increases, but there is no cut-off point as with FBD service.

Intrastate WATS rates will probably change similarly over the following 12 to 24 months.

The net result of these changes will be to make WATS line usage more appealing to small users. The changes should simplify cost decisions for those interested in establishing private conference networks.

APPENDIX D

TELECOMMUNICATIONS AND SERVICE TO THE DEVELOPMENTALLY DISABLED: PROJECT BACKGROUND

In September 1978, the Alternate media Center, School of the Arts, New York University, received a two-year grant from the Department of Health and Human Services, formerly Health, Education and Welfare, to explore and demonstrate potential applications of telecommunications in the field of developmental disabilities. This work is being conducted in collaboration with the American Association of University Affiliated Programs, the Department of Pediatric Service at The Roosevelt Hospital in New York City, and the Institute for the Future in Menlo Park.

After an extensive needs assessment, the project team in conjunction with its advisory board decided on a three-pronged approach to demonstrations:

1. In collaboration with the UAF satellite in Burlington, Vermont, and with other Vermont DD organizations, implement a coordinated program of telecommunications applications focusing within that state.
2. Explore the use of telecommunications for national "networking" among UAPs and related centers.
3. Provide technical assistance to a limited number of projects that attempt to make innovative use of telecommunications in the DD field.

Two separate electronic message systems were used as part of this project: EIES (Electronic Information Exchange System at the New Jersey Institute of Technology) and OnTyme (offered by Tymnet Corporation). Reports on each of these demonstrations are available upon request from the Institute, as are earlier studies of group communication through computers.

APPENDIX E

PROJECT PUBLICATIONS

TELECOMMUNICATIONS AND SERVICE
TO THE DEVELOPMENTALLY DISABLED

VOLUME 1: NEEDS AND OPPORTUNITIES — April 20, 1979

Summarizes results from project needs assessment, the rationale for demonstrations, and an appraisal of telecommunications options.

VOLUME 2: APPLICATION POSSIBILITIES — May 15, 1979

Discusses ideas for DD telecommunication applications gathered during needs assessment. Glossary. Bibliography.

VOLUME 3: DECISIONS ON DEMONSTRATION PROJECTS — July 2, 1979

Presents decision for implementation phase of project.

NATIONAL NETWORKING AMONG UAPS:
A PILOT TEST OF ELECTRONIC MAIL — November 1979

Summarizes results of pilot test of computer-based message system conducted by the American Association of University Affiliated Programs.

A MANUAL FOR UAF ONTYME MESSAGE SYSTEM USERS — November 1979

A specially prepared user's guide for UAP electronic message system users.

NATIONAL NETWORKING AMONG UAPS:
A TELECOMMUNICATIONS DEMONSTRATION — January 1980

Outlines plan for UAP national networking demonstration.

MAKING TELECOMMUNICATIONS WORK FOR THE DEVELOPMENTALLY DISABLED: A FIRST REPORT ON THE VERMONT DEMONSTRATIONS — January 1980

Reviews specific applications under way or planned for Vermont.

CHOOSING AN ELECTRONIC MESSAGE SYSTEM: A GUIDE FOR THE HUMAN SERVICES — September 1980

An introduction to strengths and weaknesses of electronic message systems.

ESTABLISHING A TELEPHONE CONFERENCING SYSTEM: THE DYNAMICS OF DOING IT — September 1980

Summarizes most important factors in establishing a telephone conferencing system.

ELECTRONIC MAIL AMONG UNIVERSITY TRAINING CENTERS: A DEMONSTRATION IN NATIONAL NETWORK BUILDING — November 1980

Final report of the national networking demonstration.

1981 AUDIO CONFERENCING HANDBOOK — January 1981

A practical guide for implementing an audio conferencing system.

USER PERSPECTIVE PAPERS — Forthcoming

Users and project staff write about their experiences.

Copies of the above papers may be obtained by writing:

Developmental Disabilities Project
Institute for the Future
2740 Sand Hill Road
Menlo Park, California 94025
415-854-6322

or

Alternate Media Center
School of the Arts
New York University
725 Broadway, 4th Floor
New York, New York 10003
212-598-2852

GLOSSARY

Amplified Telephone: A hands-free telephone consisting of one or more microphones and loudspeakers that amplify the telephone conversation.

Audio Conferencing: Voice communications among three or more individuals or locations. It typically involves ordinary telephones with or without amplification.

Audio Plus Graphics: Audio conferencing enhanced by simultaneous use of the electronic blackboard, facsimile devices, or an electronic pen.

Bridge: A device that connects three or more telephone lines or circuits in a single call.

Centrex: A service offered by the telephone company providing direct inward and outward dialing for PBX extensions. The PBX may be located in the telephone company central office or on the customer's premises.

Common Carrier: Any organization providing communications services to the public at nondiscriminatory rates. Common carriers are regulated and rates set by the appropriate state or federal agency.

Conference Calls: Telephone calls among three or more individuals or groups.

DDD: Direct distance dialing. The common method of placing a telephone call without operator assistance.

Dedicated Network: A group of transmission circuits devoted to a specific application. Access is limited to users of the network.

Electronic Blackboard: A device to send writing over normal telephone lines. As it is written upon, a standard-looking blackboard in one location transmits signals that are displayed at the receiving location on a television screen. These devices can be used in a two-way mode if there is a similar blackboard in another location.

FCC: Federal Communications Commission. The national regulatory body that oversees, among other things, the interstate rates for all common carriers.

Four-Wire Circuit: A four-wire circuit usually avoids some of the electrical echo problems associated with the normal ("two-wire") telephone network. A four-wire circuit allows two locations to talk and be heard simultaneously, thereby giving a greater sense of presence.

FX: Foreign eXchange line. A telephone circuit that allows the caller to place a call to a local number. The call is answered in a distant city. These lines are installed or "hardwired" on the customer's premises and are rented on a monthly basis.

OPX: Off-Premises Extension. A telephone circuit that allows the caller to access a conference bridge by picking up the telephone receiver.

PBX: Private Branch eXchange. A telephone exchange located on the customer's premises.

Port: Position on a conference bridge that accepts a telephone line.

PSN: Public Switched Network. The national communications network linking individual phones to the local telephone offices and the intercity, long distance network.

PUC: Public Utilities Commission. The state regulatory body that oversees local and toll service rates for all intrastate common carriers.

Slow-Scan Television: System for exchanging still images displayed on television monitors. "Slow-scan" means that the image is not constantly updated, as in a normal television system. Removing the requirement to provide full moving images means that narrowband transmission (often a normal telephone line) can be used, with a dramatic reduction in cost over full video teleconferencing.

Speakerphone: A brand name for an amplified telephone.

Tariff: The rate schedule filed with the FCC or PUC listing the specific charges for all classes of telephone service and equipment. Tariffs are public documents that are available for review by contacting the appropriate agency.

Tie Line: A telephone circuit connecting two PBXs.

Toll Call: Any telephone call that is transmitted beyond a defined local calling area.

Transmission Line: The circuit that transmits telephone signals. This line may be copper wire, coaxial cable, glass fiber, or microwave radio circuit.

Two-Wire Circuit: A typical telephone transmission circuit. In some applications, a four-wire system is preferable because a "four-wire" requires voice switching to avoid electrical echo and leakage.

Voice Switching: Electrical technique for opening an audio circuit only to the person who is currently speaking. Such a system allows only one person to speak at a time and often prevents others from interrupting. One result of this setup is that a person telling a joke from one location can not hear if the participants at other locations are laughing. Voice switching is an effective technique for avoiding specific acoustical and electrical problems that are often associated with audio teleconferencing, but users have sometimes found that it inhibits a free exchange in a group.

BIBLIOGRAPHY

American Telephone & Telegraph Company, Long Lines Department. FCC Tariff No. 263, pp. 26, 150-161.

Bolsky, M. I., and Stockbridge, C. The Audio Conference: What is it, Why do it, How to do it. Holmdel, NJ: Bell Labs, 1979.

Connell, Eileen. Establishing a Telephone Conferencing System: The Dynamics of Doing It. New York City: Alternate Media Center, 1980.

Elton, Martin C. J. "The Practice of Teleconferencing," Telecommunications in the U.S.: Trends and Problems. Leonard Lewin, Ed., Dedham, MA: Artech House (forthcoming).

Johansen, Robert; Spangler, Kathleen; and Vallee, Jacques. Electronic Meetings: Technical Alternatives and Social Choices. Reading, MA: Addison-Wesley, 1979.

Monson, Mavis. Bridging the Distance. An Instructional Guide to Teleconferencing. Madison: University of Wisconsin-Extension, 1978.

Parker, Lorne C., and Monson, Mavis K. Teletechniques. Englewood Cliffs, NJ: Educational Technology Publications, 1980.

Parker, Lorne C., and Olgren, Christine H. Teleconferencing and Interactive Media, Madison: University of Wisconsin-Extension, 1980.

Ward, John R. Meetings by Telephone. Stanardsville, VA: Genesis Publications, 1980.

READER RESPONSE FORM

Return to: Audio Conferencing Handbook Revision, Institute for the Future, 2740 Sand Hill Road, Menlo Park, California 94025, 415-854-6322.

1. Your evaluation of the usefulness of this handbook:

2. What was most helpful to you?

3. Are there any serious omissions of services, suppliers, or systems?

4. In future editions, what other categories would you like to see included?

5. Do you know of human service organizations who have successfully used audio conferencing?

Name:
Title:
Organization:
Address: